



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 :

A61B 17/58, A61F 5/02

A1

(11) International Publication Number:

WO 90/04948

(43) International Publication Date:

17 May 1990 (17.05.90)

(21) International Application Number: PCT/GB89/01310

(22) International Filing Date: 2 November 1989 (02.11.89)

(30) Priority data:

8825909.8

4 November 1988 (04.11.88) GB

(71) Applicant (for all designated States except US): SURGIC-
RAFT LIMITED [GB/GB]; Britten Street, Redditch,
Worcs. B97 6HF (GB).

(72) Inventors; and

(75) Inventors/Applicants (for US only): DOVE, John [GB/GB];
Park Hill, Pingle Lane, Stone, Staffs. ST3 4BQ (GB).
RAHMATALLA, Abdul, Aziz [GB/GB]; 135 Hilton
Road, Harpfields, Stoke-on-Trent ST4 6RP (GB). SELL,
Philip, John [GB/GB]; 72 Holland Road, Sutton Cold-
field, West Midlands B72 1RQ (GB).(74) Agent: HULSE & CO.; Cavendish Buildings, West Street,
Sheffield S1 1ZZ (GB).(81) Designated States: AT (European patent), AU, BE (Euro-
pean patent), BR, CH (European patent), DE (European
patent), DK, FR (European patent), GB (European pa-
tent), IT (European patent), JP, LU (European patent),
NL (European patent), NO, SE (European patent), US.

Published

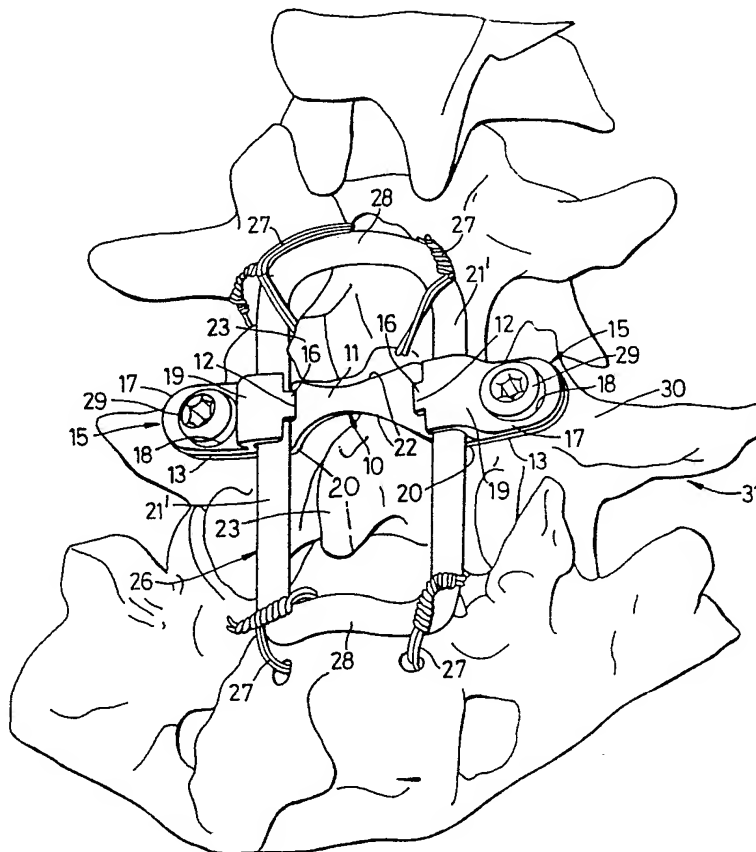
With international search report.

Before the expiration of the time limit for amending the
claims and to be republished in the event of the receipt of
amendments.

(54) Title: PEDICLE ENGAGING MEANS

(57) Abstract

Pedicle engaging means comprises a bridge member (10) and two clip members (15); the bridge member having an arched middle portion (11) with concave edges (22) to afford clearance with respect to adjacent spinous processes (23), an aperture (12) in each side of the arch, and a pair of end portions (13) each with a hole for a pedicle screw (29); each clip member (15) having a tip (16) engageable in one of the apertures (12), and a fixing portion (17) with a hole (18) for receiving a pedicle screw (29); and each clip member being cranked (at 19) so as to form with the junction (20) between the arch (11) and respective end portion (13) of the bridge member (10) a pair of clamping parts for embracing a rod or rod-like portion (21') of a spinal fixation device (26).



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	ES	Spain	MG	Madagascar
AU	Australia	FI	Finland	ML	Mali
BB	Barbados	FR	France	MR	Mauritania
BE	Belgium	GA	Gabon	MW	Malawi
BF	Burkina Fasso	GB	United Kingdom	NL	Netherlands
BG	Bulgaria	HU	Hungary	NO	Norway
BJ	Benin	IT	Italy	RO	Romania
BR	Brazil	JP	Japan	SD	Sudan
CA	Canada	KP	Democratic People's Republic of Korea	SE	Sweden
CF	Central African Republic	KR	Republic of Korea	SN	Senegal
CG	Congo	LI	Licchtenstein	SU	Soviet Union
CH	Switzerland	LK	Sri Lanka	TD	Chad
CM	Cameroon	LU	Luxembourg	TG	Togo
DE	Germany, Federal Republic of	MC	Monaco	US	United States of America
DK	Denmark				

PEDICLE ENGAGING MEANS

This invention relates to pedicle engaging means for use in spinal surgery.

Pedicle screws are well known for use in systems for internal fixation of the spine. However, problems have arisen in attempting to use pedicle screws in systems for segmental spinal fixation. Some pedicle screws need wires to secure them to rods or other devices used for segmental spinal fixation. An alternative which is sometimes used is to make use of plates (instead of rods) or custom built devices. Pedicle screws may be used when there is no lamina present and when consequently methods of sub-lamina wiring are unsuitable.

The object of the present invention is to provide pedicle engaging means particularly suited to use with existing segmental spinal fixation devices such as "Luque rods" or, more particularly, "Hartshill Rectangles" for posterior spinal surgery.

According to the present invention, pedicle engaging means comprises a bridge member having an arched middle portion with an aperture in each side of the arch, and a pair of generally coplanar end portions each with a hole for rotatably receiving a pedicle screw; and a pair of clip members each having a tip engageable in one aperture in the arched portion of the bridge member, and each having a fixing portion with a hole for rotatably receiving a pedicle screw; the hole in a clip member being in register with the hole in the respective end portion of the bridge member when the tip of the clip member is engaged in the respective aperture in

the arched portion of the bridge member, and the portion of the clip member between its tip and its fixing portion being cranked so as to form with the junction between the arched portion and the respective end portion of the bridge member a pair of clamping parts for embracing a rod or rod-like portion of a spinal fixation device.

It is anticipated at present that there are three likely occasions when the pedicle engaging means of the invention will be used:-

1. When there has been a previous extensive wired laminectomy in the lumbar region.

2. When it is necessary to bridge a number of levels and to engage intervening levels particularly to reduce slip in spondylolisthesis.

3. In painful spondylolysis in young patients where at present with sublaminar wiring the level above has to be included in order to gain fixation, whereas with the pedicle engaging means of the invention the internal fixation can be limited to one motion segment.

The bridge member and the two clip members may be formed of any biocompatible material, but a flexible material, such as stainless steel strip, enables the shape of the arched portion to be modified by the surgeons to vary the spacing between the screw holes and/or the alignment of or angularity between the end portions containing the screw holes. However, more than one size of bridge member may be provided, with arched portions of different span and/or height. The width of the arched portion may be reduced between the apertures for

engagement by the tips of the clip members, e.g., the edges of the arched portion may be concave in plan view to form a neck having its least width at the middle, to afford clearance with respect to adjacent spinous processes.

The holes in the end portions of the bridge member and/or the holes in the fixing portions of the clip members may be elongated in the lengthwise direction of the bridge member, to allow adjustment of the spacing and/or inclination of pedicle screws with respect to the general plane of the end portions of the bridge member. Formation and elongation of the holes may be effected by means of a ball cutter applied to the remote faces of the end portions of the bridge member and the fixing portions of the clip members respectively and moved towards the arched portion of the bridge member and away from the tips of the clip members respectively.

An embodiment of the invention, and the manner of its use, will now be described, by way of example only, with reference to the accompanying drawings, in which:-

Figure 1 is a side elevation of the bridge member of pedicle engaging means in accordance with the invention;

Figure 2 is a plan of the bridge member;

Figure 3 is an end elevation of the bridge member;

Figure 4 is a plan view illustrating a method of simultaneously forming two clip members;

Figure 5 is a side elevation of one clip member after bending of its tip;

Figure 6 is an end elevation from the right hand end of Figure 5;

Figure 7 corresponds to Figure 1 but shows the clip members engaged with the bridge member and rods in place for clamping thereto;

Figure 8 is an enlarged fragmentary section through the right hand end portion of the bridge member and the fixing portion of the corresponding clip member, and indicating the manner of elongating the holes; and

Figure 9 is a perspective view showing the assembly of bridge member and clip members clamped to a "Hartshill Rectangle" and secured by pedicle screws.

In Figures 1 to 3 a bridge member 10 for pedicle engaging means in accordance with the invention has an arched middle portion 11 with an aperture 12 in each side of the arch, and a pair of generally coplanar end portions 13 each with a hole 14 for rotatably receiving a pedicle screw (see Figure 9).

In Figure 4 a pair of clip members 15 are formed simultaneously, each having a tip 16 engageable in one aperture 12 in the arched portion 11 of the bridge member 10 (see Figures 7 and 9) and each having a fixing portion 17 with a hole 18 for rotatably receiving a pedicle screw (again see Figure 9).

Figures 7 and 9 show the tips 16 of the clip members 15 engaged in the apertures 12 in the arched portion 11 of the bridge member 10, the hole 18 in the fixing portion 17 of each clip member being in register with the corresponding hole 14 in the respective end portion 13 of the bridge member, and the portion 19 of each clip member 15 between its tip 16 and its

fixing portion 17 is cranked so as to form with the junction 20 between the arched portion 11 and the respective end portion 13 of the bridge member 10 a pair of clamping parts for embracing a rod or rod-like portion 21 of a spinal fixation device.

The edges 22 of the arched portion 11 are concave in plan view to form a neck having its least width at the middle, to afford clearance with respect to adjacent spinous processes 23 (see Figure 9).

The holes 14, 18 in the end portions 13 of the bridge member 10 and the fixing portions 17 of the clip members 15 respectively are formed and elongated by a ball cutter applied to the remote faces 24, 25 respectively and moved towards the arched portion 11 of the bridge member and away from the tips 16 of the clip portions respectively (as indicated by the arrows in Figure 8).

Figure 9 shows a "Hartshill Rectangle" 26 secured in place on the lower lumbar spine by sub-laminar wires 27 at the junctions between the longer sides 21' and the bent shorter sides 28 of the rectangle, and pedicle screws 29 - securing the assembly of the bridge member 10 and clip members 15 to the rectangle and to the spine, the screws 29 passing through the pedicle 30 and into the body of a vertebra 31.

CLAIMS

1. Pedicle engaging means comprising a bridge member having an arched middle portion with an aperture in each side of the arch, and a pair of generally coplanar end portions each with a hole for rotatably receiving a pedicle screw; and a pair of clip members each having a tip engageable in one aperture in the arched portion of the bridge member, and each having a fixing portion with a hole for rotatably receiving a pedicle screw; the hole in a clip member being in register with the hole in the respective end portion of the bridge member when the tip of the clip member is engaged in the respective aperture in the arched portion of the bridge member, and the portion of the clip member between its tip and its fixing portion being cranked so as to form with the junction between the arched portion and the respective end portion of the bridge member a pair of clamping parts for embracing a rod or rod-like portion of a spinal fixation device.

2. Pedicle engaging means as in Claim 1 formed of stainless steel strip.

3. Pedicle engaging means as in Claim 1 or Claim 2, wherein the width of the arched portion of the bridge member is reduced between the apertures for engagement by the tips of the clip members.

4. Pedicle engaging means as in Claim 3, wherein the edges of the arched portion are concave in plan view to form a neck having its least width at the middle.

5. Pedicle engaging means as in any one of Claims 1

to 4, wherein the holes in the end portions of the bridge member are elongated in the lengthwise direction of the bridge member.

6. Pedicle engaging means as in any one of Claims 1 to 5, wherein the holes in the fixing portions of the clip members are elongated in the lengthwise direction of the bridge member.

7. Pedicle engaging means as in Claim 5 or Claim 6, wherein formation and elongation of the holes is effected by means of a ball cutter applied to the remote faces of the end portions of the bridge member and the fixing portions of the clip members respectively and moved towards the arched portion of the bridge member and away from the tips of the clip members respectively.

8. Pedicle engaging means substantially as hereinbefore described with reference to the accompanying drawings.

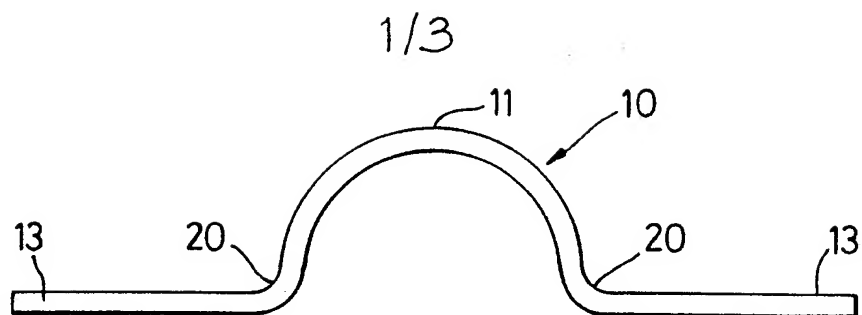


Fig. 1

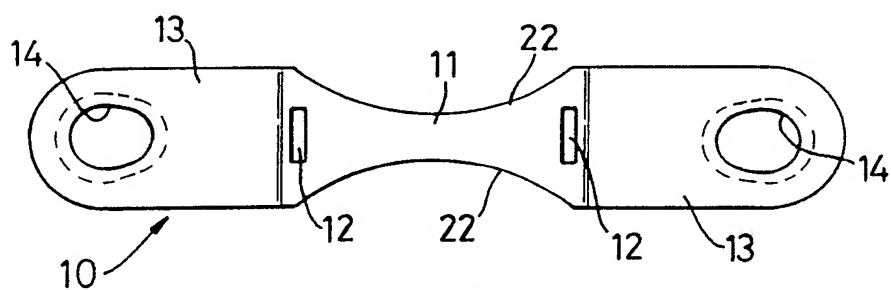


Fig. 2

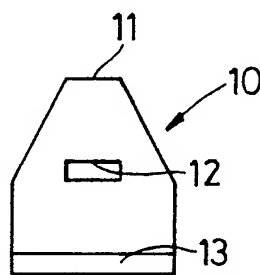


Fig. 3

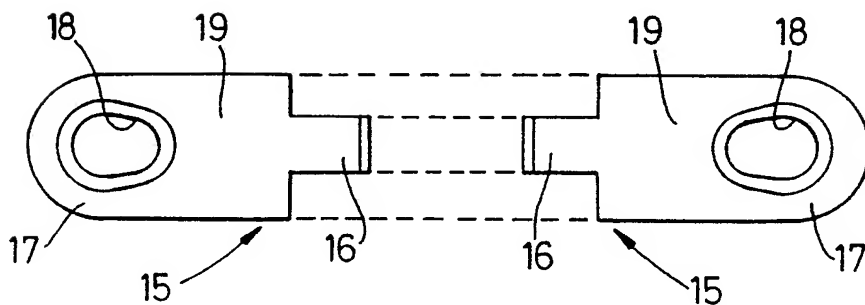


Fig. 4

SUBSTITUTE SHEET

2/3

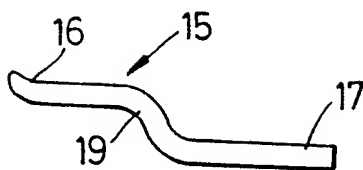


Fig. 5

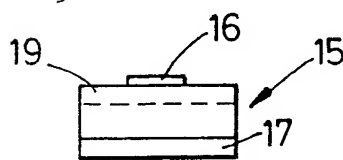


Fig. 6

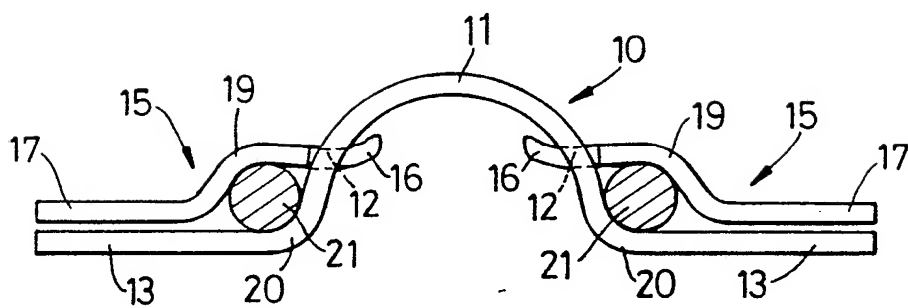
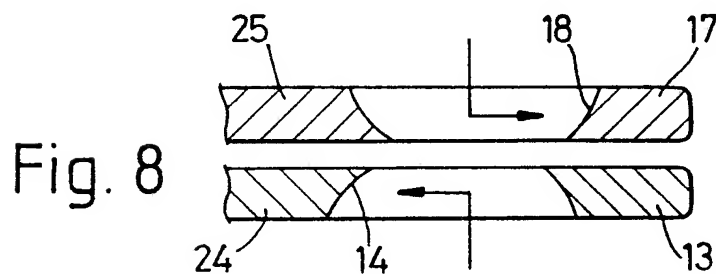


Fig. 7



3/3

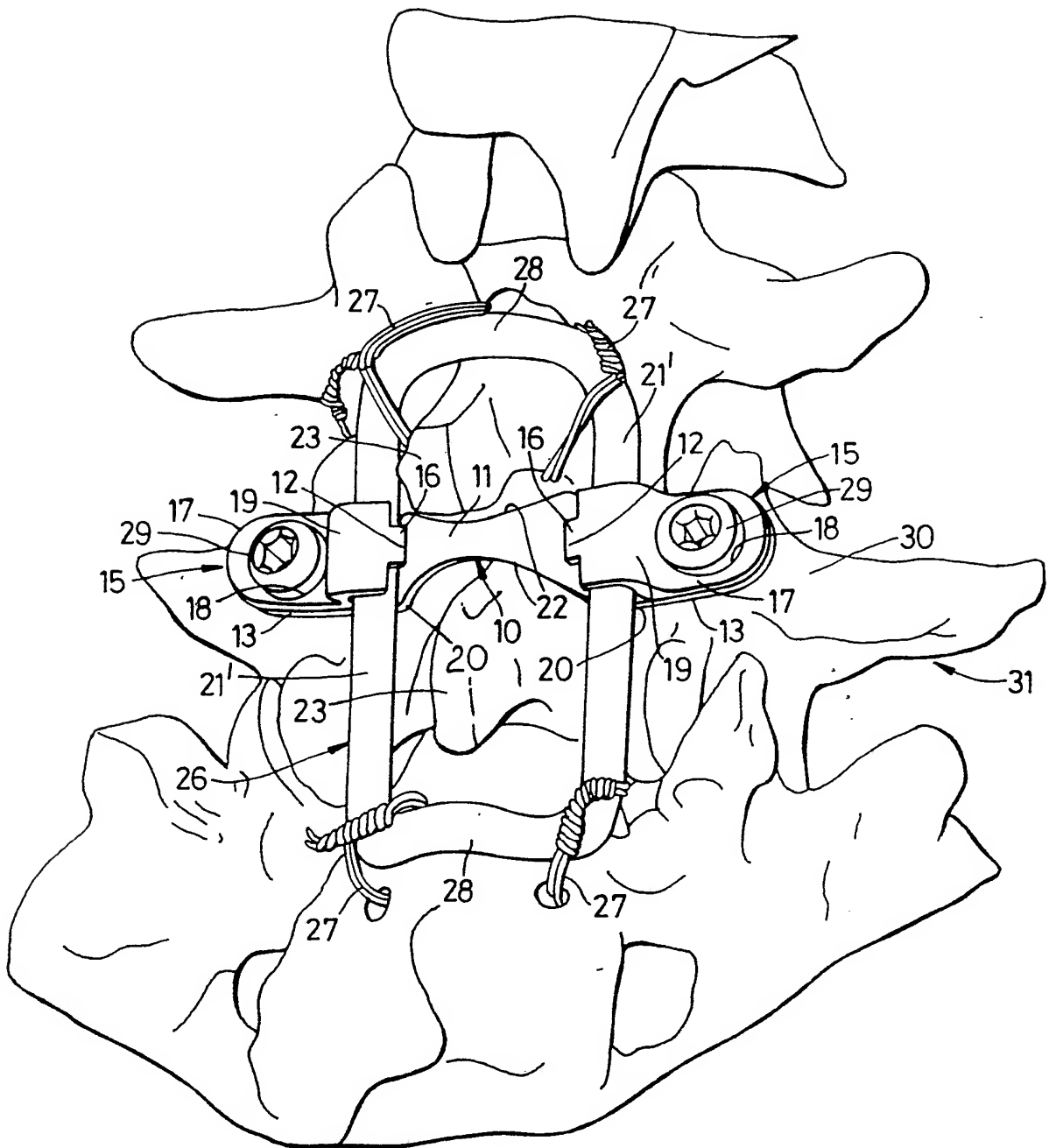


Fig. 9

SUBSTITUTE SHEET

INTERNATIONAL SEARCH REPORT

International Application No. PCT/GB 89/01310

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶ According to International Patent Classification (IPC) or to both National Classification and IPC IPC ⁵ : A 61 B 17/58, A 61 F 5/02														
II. FIELDS SEARCHED <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black;">Minimum Documentation Searched ⁷</div> <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 30%; text-align: left; border-bottom: 1px solid black;">Classification System ¹</th> <th style="width: 70%; text-align: left; border-bottom: 1px solid black;">Classification Symbols</th> </tr> <tr> <td style="vertical-align: top; padding: 5px;">IPC⁵</td> <td style="vertical-align: top; padding: 5px;">A 61 F, A 61 B, F 16 B</td> </tr> </table> <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black;">Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸</div>			Classification System ¹	Classification Symbols	IPC ⁵	A 61 F, A 61 B, F 16 B								
Classification System ¹	Classification Symbols													
IPC ⁵	A 61 F, A 61 B, F 16 B													
III. DOCUMENTS CONSIDERED TO BE RELEVANT ⁹ <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 10%; text-align: left; border-bottom: 1px solid black;">Category ¹⁰</th> <th style="width: 70%; text-align: left; border-bottom: 1px solid black;">Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²</th> <th style="width: 20%; text-align: left; border-bottom: 1px solid black;">Relevant to Claim No. ¹³</th> </tr> <tr> <td style="vertical-align: top; padding: 5px;">A</td> <td style="vertical-align: top; padding: 5px;">US, A, 4648388 (STEFFEE) 10 March 1987, see column 3, lines 21-28; figure 4 --</td> <td style="vertical-align: top; text-align: center; padding: 5px;">1</td> </tr> <tr> <td style="vertical-align: top; padding: 5px;">A</td> <td style="vertical-align: top; padding: 5px;">EP, A, 0146347 (SURGICRAFT) 26 June 1985, see page 6, line 24 - page 7, line 10; figure 2 --</td> <td style="vertical-align: top; text-align: center; padding: 5px;">1</td> </tr> <tr> <td style="vertical-align: top; padding: 5px;">A</td> <td style="vertical-align: top; padding: 5px;">DE, U, 8526121 (PSA) 13 February 1986, see figures -----</td> <td style="vertical-align: top; text-align: center; padding: 5px;">1</td> </tr> </table>			Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³	A	US, A, 4648388 (STEFFEE) 10 March 1987, see column 3, lines 21-28; figure 4 --	1	A	EP, A, 0146347 (SURGICRAFT) 26 June 1985, see page 6, line 24 - page 7, line 10; figure 2 --	1	A	DE, U, 8526121 (PSA) 13 February 1986, see figures -----	1
Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³												
A	US, A, 4648388 (STEFFEE) 10 March 1987, see column 3, lines 21-28; figure 4 --	1												
A	EP, A, 0146347 (SURGICRAFT) 26 June 1985, see page 6, line 24 - page 7, line 10; figure 2 --	1												
A	DE, U, 8526121 (PSA) 13 February 1986, see figures -----	1												
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; vertical-align: top; padding: 5px;"> ¹⁰ Special categories of cited documents: ¹⁰ "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed </td> <td style="width: 50%; vertical-align: top; padding: 5px;"> "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "A" document member of the same patent family </td> </tr> </table>			¹⁰ Special categories of cited documents: ¹⁰ "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "A" document member of the same patent family										
¹⁰ Special categories of cited documents: ¹⁰ "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "A" document member of the same patent family													
IV. CERTIFICATION <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; vertical-align: top; padding: 5px;"> Date of the Actual Completion of the International Search 26th February 1990 </td> <td style="width: 50%; vertical-align: top; padding: 5px;"> Date of Mailing of this International Search Report 24 02 90 </td> </tr> <tr> <td style="vertical-align: top; padding: 5px;"> International Searching Authority EUROPEAN PATENT OFFICE </td> <td style="vertical-align: top; padding: 5px;"> Signature of Authorized Officer <div style="text-align: right; font-weight: bold; font-size: 1.2em;">T.K. WILLIS</div> </td> </tr> </table>			Date of the Actual Completion of the International Search 26th February 1990	Date of Mailing of this International Search Report 24 02 90	International Searching Authority EUROPEAN PATENT OFFICE	Signature of Authorized Officer <div style="text-align: right; font-weight: bold; font-size: 1.2em;">T.K. WILLIS</div>								
Date of the Actual Completion of the International Search 26th February 1990	Date of Mailing of this International Search Report 24 02 90													
International Searching Authority EUROPEAN PATENT OFFICE	Signature of Authorized Officer <div style="text-align: right; font-weight: bold; font-size: 1.2em;">T.K. WILLIS</div>													

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.**

GB 8901310

SA 32126

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 14/03/90
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 4648388	10-03-87	EP-A- 0220736 US-A- 4719905	06-05-87 19-01-88
EP-A- 0146347	26-06-85	GB-A,B 2151928 US-A- 4686970	31-07-85 18-08-87
DE-U- 8526121	02-01-86	None	